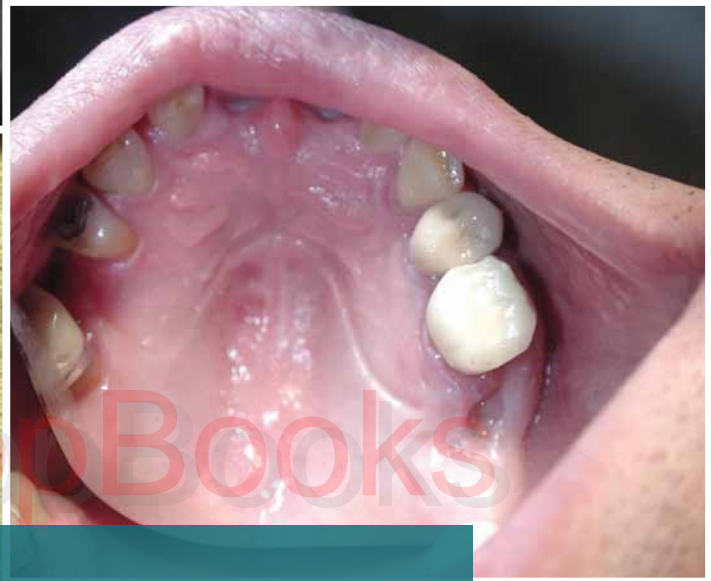




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# Management of Complications of Dental Extractions

A Peer-Reviewed Publication

Written by Bach T. Le, DDS, MD and Ian Woo, MS, DDS, MD

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## Educational Objectives

Upon completion of this course, the clinician will be able to do the following:

1. Describe the various procedural protocols to stop post-operative bleeding.
2. List the four cardinal signs of inflammatory process in healing and be able to accurately assess and treat cases of abnormal surgical swelling and infection.
3. List and describe the cautionary procedural obstacles of dry socket, sinus perforation, root tip in maxillary sinus, and nerve injury.
4. Describe the clinician should treat a surgical complication in the clinical setting or refer the patient to a specialist.

## Abstract

Dental extractions are a commonly performed surgical procedure in the United States. There are a number of factors that determine difficulties related to extractions, including root morphology and proximity to anatomical structures, bleeding, post-operative swelling and infection. Dental professionals performing extractions must conduct a full pre-operative evaluation, and must be prepared to deal with extraction difficulties and complications.

## Introduction

Dental extraction is one of the most commonly performed surgical procedures in the United States. Difficulties of extractions are multi-factorial. Depth and angle of impaction are obvious factors that should be assessed. Factors that are also important in the decision-making process are the age of the patient, general medical health, ethnicity, anatomy (trismus, tongue size, tooth structures), mental status (anxiety), and ability to cooperate. Extraction difficulty increases when the following conditions exist: dense supporting bone, difficult root morphology (Figure 1 and 2), teeth with large restorations or decay, adjacent teeth with large restorations, and brittle teeth associated with endodontic treatment.<sup>1</sup> Because most general practitioners perform extractions under local anesthesia with the patient awake, the influence of these factors is greatly magnified. Therefore, it is important for practitioners to be aware of them when consulting patients for surgical extractions in order to know when to refer and when to attempt the extractions themselves. If the clinician is to perform difficult surgical extractions, it is prudent for them to be ready to deal with the potential complications associated with this procedure. In this article, we will discuss some of the most common complications that clinicians encounter during dental extractions.

## Bleeding

One of the most common complications of all surgeries is post-operative bleeding. Post-operative bleeding from

Figure 1. Difficult Root Morphology: Long Roots



Figure 2. Difficult Root Morphology: Curved Roots



dental extraction is commonly due to venous bleed from nutrient blood vessels in the supporting bone but can also be due to an arterial source. Other causes of post-operative bleeding may include the failure to debride all granulation tissues from the socket, torn soft-tissue, and rebound vasodilatation following the use of epinephrine-containing anesthetics. Patient factors can also contribute to excessive and prolonged post-operative bleeding. Patients who are on medications such as Coumadin, Aspirin, Plavix, and chemotherapeutic agents may have prolonged bleeding. Patients who have uncontrolled hypertension, liver diseases, platelet deficiency, hemophilia, von Willebrand factor deficiency, or vitamin K-deficiency (from prolonged antibiotic intake or GI surgeries) may also pose a significant risk for post-operative bleeding.<sup>7</sup> Therefore, it is very important in the pre-operative consultation to elicit a thorough medical history and obtain appropriate medical consults as indicated.

Initial management of post-operative bleeding usually involves careful examination and visualization of the bleeding site. The surgical site should be inspected for any bleeding arteries. If an arterial bleeding source is identified,

firm pressure should be applied to control the bleeding and ligation of the artery should be performed with resorbable sutures. If a source is identified on the osseous structure, direct burnishing technique, using instruments such as a curette or hemostat, may help close off the bleeding vessels. Bone wax can also be applied to the bleeding osseous structure to control bleeding. Injecting epinephrine-containing anesthetics into the site for hemostasis should be done with caution because the vasoconstrictor may mask the true source of hemorrhage only temporarily. In the absence of an obvious source of bleeding, a 2" × 2" gauze dressing should be folded and placed into the socket with the patient instructed to bite down on it firmly. This period should last for at least 15 minutes because the average bleeding time is 10–12 minutes. It is also advisable to sit the patient upright to decrease the venous pressure in the head and neck area. The socket should be reexamined after this period. If bleeding continues, a hemostatic agent, such as Gelfoam (gelatin sponge), Surgicel (oxidized regenerated cellulose), or collagen plug, can be packed at the bottom of the socket and oversewn with sutures. Gauze dressing is reapplied for 15 minutes. Gelfoam and Surgicel work by forming a matrix for clot stabilization. Surgicel is more efficient in hemostasis but less readily incorporated into the clot when compared to Gelfoam. Collagen plug stimulates platelets adherence and stabilizes the clot. The use of Gelfoam saturated with topical thrombin is also an effective method of stopping bleeding.

Sometimes it may be necessary to cauterize the bleeding source with electrocautery. If electrocautery is not readily available, this can be done by using a heated endodontic instrument and burnishing it against the bleeding vessel. However, extreme care must be used to avoid burning the lips, tongue and adjacent tissues. Also, adequate anesthesia should be achieved before using cauterization.

Signs and symptoms of hypotension, such as dizziness, shortness of breath, pallor, and tachycardia, should always be assessed if there has been evidence of profuse bleeding. Vitals signs should also be monitored. As a general rule of thumb, do not discharge patients from the office until hemostasis has been achieved.

## Surgical Swelling & Infection

Post-operative soft-tissue swelling can be a normal part of the healing process. The wound heals by the inflammatory process, which has four cardinal signs: tumor (swelling), rubor (redness), dolor (pain), and calor (heat). The initial clot serves as a wound protector as well as scaffolding for the formation of granulation tissues. Granulation tissues are highly vascularized tissue beds that help bring nutrients and fibroblasts to the wound for repair. Due to the increased blood flow, increased hydrostatic pressure, and increased transudate that contains all the immune cell types and chemotactic factors, swelling is ensured.

Particularly during surgical extraction of third molars, the removal of bone and the elevation of periosteum can cause significant swelling in the post-operative period. This swelling will increase throughout the first three to four post-operative days. Elevation of the head and neck during this period is recommended to minimize swelling. Ice packs may be used on alternating sides every 20 minutes during the first 24–48 hours but may do little to alleviate swelling associated with oral surgery.<sup>5</sup> Administration of steroids has been shown to decrease post-operative swelling.<sup>8,13</sup> Surgical swelling should slowly diminish from Post-Operative Day 3 or 4 onwards, until it finally disappears by Day 7 to 10. This process may be expedited by using a warm pack on the swollen area.

Nonsurgical post-operative swelling is usually due to infection of the surgical site. It usually manifests as an increase in swelling beyond Post-Operative Day 3 or 4 with increasing pain, presence of purulent drainage from the wound, and fever and chills. The causes of post-operative infection can be multiple and can range from an immunocompromised host (diabetics, cancer patients, HIV-positive individuals, patients under chemotherapy, or radiation therapy, etc.) to poor surgical techniques or poor instrument sterilization. Management of post-operative infection depends on the extent of the disease. Acute localized abscess may be treated initially with a course of antibiotics targeted towards the most common oral flora (mainly gram-positive cocci), whereas more extensive infection may require incision and drainage of the infective material in addition to antibiotic therapy. Chronic infection tends to involve multiple organisms, including gram-negative bacilli. Multi-drug therapy may be indicated in this setting. Whenever an infection of the oral cavity is encountered, one must be cognizant of the potential life-threatening compromise of the airway. If the patient expresses difficulty in breathing, shortness of breath, or an inability to tolerate oral secretions, immediate referral to the emergency room is mandated. More extensive incision and drainage, airway management, intravenous antibiotics, and hospitalization would be the appropriate treatment at that time.

The medical literature does not support the routine administration of prophylactic post-operative antibiotics to healthy noninfected patients for surgical dental extraction, including wisdom teeth.<sup>15,16</sup> If antibiotics are to be used, a pre-operative dose (administered one hour prior to surgery), rather than a post-operative dose, is more effective in preventing wound infection.<sup>10</sup> Many practitioners feel obligated to prescribe post-operative antibiotics to all patients who have undergone third-molar extractions because many of their colleagues do it or because the patient may expect a prescription. It is our duty to inform and educate patients about their expected post-operative course (surgical swelling does not equate to infection) and



Figure 3



Figure 4



Figure 5



the proper use of antibiotics in the appropriate setting. Without a susceptible host or a high concentration of pathogens present, antibiotics are not indicated.

### Dry Socket

Dry socket is also known as alveolar osteitis. It is delayed wound healing of the alveolar bone after dental extractions. It can be confused with normal post-operative pain. Dry socket is usually diagnosed on Post-Operative Day 3

to 5 when the pain suddenly intensifies instead of gradually decreasing. The pain is described as throbbing in nature and is difficult to control. There is also a distinctive foul odor from the wound that the patient may complain about. Examination of the extraction socket will reveal bare bone or minimal granulation tissue. The pain stems from the direct communication of the oral cavity with the socket base. The incidence of dry socket ranges from 1 percent to 3 percent.<sup>2,6</sup> The exact cause of dry socket is not known, but it is generally believed that the protective blood clot formed in the first few post-operative days is dissolved (a process known as fibrinolysis). Therefore, the healing process cannot be initiated. Risk factors leading to dry socket include cigarette smoking, a history of head and neck radiation therapy, chemotherapy, oral contraceptives, and traumatic and prolonged extractions.<sup>3</sup>

Treatment focus should be directed at symptomatic relief with medicated dressing and analgesics. The socket should first be washed gently with warm saline. It should not be curetted as this will further delay healing. If medicated dressings such as eugenol or benzocaine are used, they should be changed within the first 48 hours and then daily or every other day to minimize the chance of infection until the patient is asymptomatic. It is important to remember that dry socket is delayed wound healing that will eventually heal on its own. Patient reassurance and close follow-up care are important in its management. Antibiotics are usually not indicated.

### Sinus Perforation

The maxillary sinus is a potential source of complication during the extractions of upper molars. The floor of the sinus is usually the closest to the palatal root of the upper first molars.<sup>9</sup> The floor of the sinus may be so close to the roots that part of it can be removed with the tooth during routine extractions. Other times, the sinus can be easily perforated during traumatic retrieval of broken root tips. One easy way to test for sinus perforation is to squeeze close the patient's nostrils, then ask the patient to breathe out through their nose with their mouth wide open. If the sinus is perforated, air will leak from the nasal passage through the sinus into the oral cavity. Using indirect vision with the help of a mouth mirror, one would see bloody air bubbles. However, this test should only be limited to the initial evaluation of sinus perforation and should not be encouraged in the post-operative course.

Management of a perforated sinus depends on the size of the defect. Patients are informed of the complication and instructed about sinus precautions. Patients are advised against creating suction by smoking or sucking on straws. Heavy sneezing or forcefully blowing the nose should be suppressed. Analgesics and nasal decongestants such as Sudafed can be prescribed as needed. Antibiotics such as Augmentin can be prescribed if there is evidence of acute or

chronic sinusitis in the patient's history. Small defects (less than 2mm) are usually left alone and should heal up without any surgical intervention. For medium defects (2–6mm), Gelfoam can be placed over the defect and secured with a figure-of-eight suture to limit the communication of the sinus with the oral cavity. Large defects (greater than 6mm) will require primary closure using a buccal or palatal soft-tissue flap.<sup>4</sup> Failure to close a large sinus perforation can result in the formation of an oro-antral fistula (Figure 3).

### Root Tip in Maxillary Sinus

As mentioned above, the floor of the sinus is closely associated with the maxillary molar roots. If a root tip is pushed into the sinus during extractions, place the patient in an upright position to allow gravity to draw the root tip closer to the perforation. Ask the patient to blow the nose with nostrils closed, then watch for the root tip to appear in view near the perforation for suctioning. One can also try antral lavage, in which saline is injected into the sinus in an attempt to flush the root tip out. Iodoform gauze strips can also be packed into the sinus which, when pulled out, tend to catch and remove the root tip as well. If these local measures are unsuccessful, the patient may require a Caldwell-Luc procedure, in which the ipsilateral canine fossa is entered for a direct visualization of the sinus and removal of the root tip.<sup>9</sup>

### Nerve Injury

The inferior alveolar nerve and artery are both contained within the inferior alveolar canal. The course of this canal is such that it usually runs buccal and slightly apical to the roots of the mandibular molars. During extraction of the mandibular molars, due to the proximity of the roots, the nerve can be traumatized. Some radiological findings that predict this close proximity include darkening or notching of the roots, deflected roots at the canal, narrowing of the roots, narrowing of the canal, disruption of the canal outline, and diversion of the canal from its normal course (Figure 4).

The lingual nerve travels medial to the lingual plate near the second and third molars region. Overzealous dissection of the lingual gingiva or aggressive sectioning of the molar during extraction can result in injury to the lingual nerve.<sup>11</sup> Fracture of the lingual plate during elevation can also traumatize this nerve. The overall incidence of inferior alveolar nerve and lingual injury during mandibular molar extractions ranges between 0.6–5 percent.<sup>12</sup> Younger patients have a lower incidence of injury and a better prognosis. Prognosis for recovery is based on the type of injury.

The Seddon classification has three types of injuries: axonotmesis, neuropraxia, and neurotmesis. Axonotmesis involves the loss of the relative continuity of the axon and its covering of myelin but preservation of the connective tissue

framework of the nerve (the encapsulating tissue, the epineurium and perineurium). Neuropraxia involves the interruption in conduction of the impulse down the nerve fiber and recovery takes place without Wallerian degeneration. This is the mildest form of nerve injury. It is brought about by compression or blunt blows close to the nerve. There is a temporary loss of function which is reversible within hours to months of the injury. Neurotmesis is more severe and occurs on contusion, stretch, and lacerations. Not only the axon, but the encapsulating connective tissue also loses its continuity in this case.

Management of nerve injury begins with careful documentation of the injury. The patient's symptoms, the distribution of the injury, and the degree of sensory deficit (touch and proprioception, pain and temperature) should be mapped and recorded at all follow-up visits.<sup>14</sup> Initially, patients should be followed up weekly. Most nerve injuries resolve spontaneously over time without intervention; however, this resolution may take months.<sup>12</sup> Patients should be reassured that most of these injuries are sensory in nature and do improve with time. Thus, no facial deformities, compromise in tongue movements, or speech deficits will result. Changing of sensation and decreasing in injury distribution over a short time are usually good signs that the nerve is recovering and the injury reversible. In cases where there is an observed nerve injury or there is no change in sensation or injury distribution, it is best to refer to an oral surgeon trained in micro nerve repair for evaluation.

### Conclusion

Dental practitioners who perform dental extractions should be prepared to deal with all potential complications associated with this procedure. Several common post-operative complications of dental extractions have been discussed here, and their etiologies and managements explored. It is our hope that general practitioners will be more prepared to manage these complications should they arise in the clinical setting.

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## Questions

1. When considering third-molar extractions, the \_\_\_\_\_ is an important factor.
  - a. angle of impaction
  - b. age of the patient
  - c. mental status of the patient
  - d. all of the above
2. According to the article, \_\_\_\_\_ is/are likely to increase the difficulty of extraction.
  - a. brittle, supporting bone associated with prosthodontic treatment
  - b. large restorations on nonadjacent teeth
  - c. difficult root morphology
  - d. local anesthesia
3. Post-operative bleeding from dental extraction can be due to \_\_\_\_\_.
  - a. venous bleeding
  - b. crevicular bleeding
  - c. arterial bleeding
  - d. a and c
4. Post-operative bleeding is \_\_\_\_\_ occurrence when performing third molar extractions.
  - a. an unusual
  - b. a frequent
  - c. a desirable
  - d. a and c
5. \_\_\_\_\_ can influence the difficulty of dental extractions.
  - a. Trismus
  - b. Tooth structures
  - c. Tongue size
  - d. all of the above
6. \_\_\_\_\_ is not listed by the authors as a patient factor in post-operative bleeding.
  - a. Uncontrolled hypertension
  - b. Vitamin-B deficiency
  - c. Chemotherapeutic agents
  - d. Liver disease
7. Patients who are on \_\_\_\_\_, amongst others, may have prolonged bleeding.
  - a. aspirin
  - b. Plavix
  - c. chemotherapeutic agents
  - d. all of the above
8. If an arterial bleeding source is identified, the authors recommend \_\_\_\_\_ as an initial treatment.
  - a. applying firm pressure to the bleeding area and ligating the area with sutures
  - b. instructing the patient to bite down on a gauze dressing
  - c. electrocautery
  - d. injecting epinephrine-containing anesthetics into the site
9. Post-operative bleeding following dental extraction normally lasts for \_\_\_\_\_.
  - a. 4–6 minutes
  - b. 7–9 minutes
  - c. 10–12 minutes
  - d. 15 minutes
10. If a source of bleeding is identified on the osseous structure, direct burnishing technique, using instruments such as a \_\_\_\_\_ may help close off the bleeding vessels.
  - a. curette or hemostat
  - b. curette or rongeur
  - c. hemostat or forceps
  - d. all of the above
11. If bleeding continues, use of \_\_\_\_\_ is recommended to achieve hemostasis.
  - a. gelatin sponge
  - b. oxidized regenerated cellulose
  - c. collagen plug
  - d. any of the above

## Questions (Continued)

12. Gelatin sponge \_\_\_\_\_.
  - a. forms a matrix for clot stabilization
  - b. is more efficient in hemostasis than oxidized regenerated cellulose
  - c. is incompatible with topical thrombin
  - d. stimulates platelet adherence
13. A collagen plug \_\_\_\_\_.
  - a. stabilizes the clot
  - b. stimulates platelet adherence
  - c. is incompatible with topical anesthetics
  - d. a and b
14. When conducting electrocautery, it is important to \_\_\_\_\_.
  - a. first achieve adequate anesthesia
  - b. avoid inadvertently burning adjacent tissues
  - c. avoid burning the lips and tongue
  - d. all of the above
15. \_\_\_\_\_ is symptomatic of hypotension.
  - a. Dizziness
  - b. Shortness of breath
  - c. Pallor
  - d. all of the above
16. Post-operative soft-tissue swelling \_\_\_\_\_.
  - a. can be a normal part of the healing process
  - b. is usually indicative of infection requiring antibiotics
  - c. generally considered a cause for serious concern
  - d. is almost always caused by patient health factors
17. \_\_\_\_\_ is one of the four cardinal signs of the inflammatory process.
  - a. Tumor
  - b. Rubor
  - c. Dolor
  - d. Calor
18. Granulation tissues \_\_\_\_\_.
  - a. help bring nutrients to the wound for repair
  - b. carry fibroblasts away from the wound
  - c. form atop the wound's initial clot
  - d. none of the above
19. Post-operative surgical swelling can be expected to diminish from \_\_\_\_\_ days post-operatively.
  - a. 3-4
  - b. 5-6
  - c. 7-8
  - d. 9-10
20. Post-operative surgical swelling can be expected to disappear after \_\_\_\_\_ post-operative days.
  - a. two to four
  - b. three to five
  - c. six to eight
  - d. seven to ten
21. \_\_\_\_\_ is not cited by the authors as a cause of nonsurgical post-operative swelling.
  - a. Diabetes
  - b. High cholesterol
  - c. HIV-positive status
  - d. Improperly sterilized instruments
22. When treating nonsurgical post-operative swelling, immediate referral to the emergency room is required if \_\_\_\_\_.
  - a. the patient experiences shortness of breath
  - b. the presence of multiple gram-positive cocci is confirmed
  - c. drainage of the infective material is required
  - d. gram-negative bacilli are causing chronic infection
23. The medical literature \_\_\_\_\_ the routine administration of prophylactic post-operative antibiotics for surgical dental extraction of wisdom teeth.
  - a. does not support
  - b. supports
  - c. strongly supports
  - d. none of the above
24. If antibiotics are to be used, the authors recommend a \_\_\_\_\_ dose to prevent wound infection.
  - a. post-operative
  - b. peri-operative
  - c. mid-operative
  - d. pre-operative
25. Dry socket is also known as \_\_\_\_\_.
  - a. alveolar osteostosis
  - b. alveolar osteitis
  - c. crestal ostitis
  - d. b and c
26. Dry socket \_\_\_\_\_.
  - a. is proven to be caused by fibrinolysis
  - b. occurs in 8 percent of all extractions
  - c. is delayed wound healing after dental extraction
  - d. is easily treated
27. Dry socket is not \_\_\_\_\_.
  - a. delayed wound healing after dental extractions
  - b. known as alveolar osteitis
  - c. a cause of normal post-operative pain
  - d. ever diagnosed until it is too late
28. Dry socket is usually diagnosed \_\_\_\_\_ days post-operatively.
  - a. one to two
  - b. two to four
  - c. three to five
  - d. four to seven
29. Initial management of a perforated sinus depends primarily on \_\_\_\_\_.
  - a. patient compliance
  - b. post-operative bleeding
  - c. the size of the defect
  - d. patient health factors
30. Small defects less than \_\_\_\_\_ should heal with no intervention.
  - a. 2 mm
  - b. 3 mm
  - c. 4 mm
  - d. 5 mm
31. Defects larger than 6mm require primary closure using a \_\_\_\_\_.
  - a. buccal or palatal soft-tissue flap
  - b. crestal flap
  - c. gelatin sponge
  - d. all of the above
32. The proximity of the roots of the mandibular third molar to the inferior alveolar nerve can be predicted by \_\_\_\_\_ as a radiological finding.
  - a. lightening of the roots
  - b. narrowing of the roots
  - c. widening of the roots
  - d. none of the above
33. The Seddon classification has \_\_\_\_\_ as one of the types of injury.
  - a. neurotaxis
  - b. axonotmesis
  - c. ataxia
  - d. all of the above
34. Neurotmesis involves the \_\_\_\_\_.
  - a. loss of the relative continuity of the axon combined with the preservation of the encapsulated connective tissue framework of the nerve
  - b. interruption in conduction of the neural impulse down the nerve fiber and subsequent recovery without Wallerian degeneration
  - c. temporary loss of function, which is reversible within six to eight weeks
  - d. loss of the relative continuity of both the axon and the encapsulated connective tissue
35. \_\_\_\_\_ is thought to be the mildest form of nerve injury.
  - a. Neuropraxia
  - b. Axonotmesis
  - c. Neurotmesis
  - d. Axonoprxia



# Management of Complications of Dental Extractions

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- Describe the various procedural protocols to stop post-operative bleeding.
- List the four cardinal signs of inflammatory process in healing and be able to accurately assess and treat cases of abnormal surgical swelling and infection.
- List and describe the cautionary procedural obstacles of dry socket, sinus perforation, root tip in maxillary sinus, and nerve injury.
- Describe the clinician should treat a surgical complication in the clinical setting or refer the patient to a specialist.

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| 2. To what extent were the course objectives accomplished overall? | 5 | 4 | 3 | 2 | 1 | 0 |
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|---|---|---|---|---|---|---|
| 4. How would you rate the objectives and educational methods? | 5 | 4 | 3 | 2 | 1 | 0 |
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- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 5. How do you rate the author's grasp of the topic? | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|
- 
- |  |   |   |   |   |   |   |
|--|---|---|---|---|---|---|
| 6. Please rate the instructor's effectiveness. | 5 | 4 | 3 | 2 | 1 | 0 |
|--|---|---|---|---|---|---|
- 
- |  |   |   |   |   |   |   |
|--|---|---|---|---|---|---|
| 7. Was the overall administration of the course effective? | 5 | 4 | 3 | 2 | 1 | 0 |
|--|---|---|---|---|---|---|
- 
- |   |  |     |  |    |  |  |
|---|--|-----|--|----|--|--|
| 8. Do you feel that the references were adequate? |  | Yes |  | No |  |  |
|---|--|-----|--|----|--|--|
- 
- |   |  |     |  |    |  |  |
|---|--|-----|--|----|--|--|
| 9. Would you participate in a similar program on a different topic? |  | Yes |  | No |  |  |
|---|--|-----|--|----|--|--|
- 
- |   |  |  |  |  |  |  |
|---|--|--|--|--|--|--|
| 10. If any of the continuing education questions were unclear or ambiguous, please list them. |  |  |  |  |  |  |
|---|--|--|--|--|--|--|

11. Was there any subject matter you found confusing? Please describe.

12. What additional continuing dental education topics would you like to see?

Mail completed answer sheet to

**Academy of Dental Therapeutics and Stomatology,**  
A Division of PennWell Corp.

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|---------------------|---------------------|
| 1. (A) (B) (C) (D)  | 19. (A) (B) (C) (D) |
| 2. (A) (B) (C) (D)  | 20. (A) (B) (C) (D) |
| 3. (A) (B) (C) (D)  | 21. (A) (B) (C) (D) |
| 4. (A) (B) (C) (D)  | 22. (A) (B) (C) (D) |
| 5. (A) (B) (C) (D)  | 23. (A) (B) (C) (D) |
| 6. (A) (B) (C) (D)  | 24. (A) (B) (C) (D) |
| 7. (A) (B) (C) (D)  | 25. (A) (B) (C) (D) |
| 8. (A) (B) (C) (D)  | 26. (A) (B) (C) (D) |
| 9. (A) (B) (C) (D)  | 27. (A) (B) (C) (D) |
| 10. (A) (B) (C) (D) | 28. (A) (B) (C) (D) |
| 11. (A) (B) (C) (D) | 29. (A) (B) (C) (D) |
| 12. (A) (B) (C) (D) | 30. (A) (B) (C) (D) |
| 13. (A) (B) (C) (D) | 31. (A) (B) (C) (D) |
| 14. (A) (B) (C) (D) | 32. (A) (B) (C) (D) |
| 15. (A) (B) (C) (D) | 33. (A) (B) (C) (D) |
| 16. (A) (B) (C) (D) | 34. (A) (B) (C) (D) |
| 17. (A) (B) (C) (D) | 35. (A) (B) (C) (D) |
| 18. (A) (B) (C) (D) |                     |

AGD Code 311

**PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.**

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